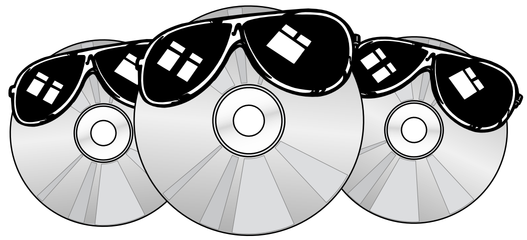
# RPM News

▲ Remedial Project Manager News ▲

"Communicating Navy Installation Restoration Program News and Information Among All Participants"

Summer 1998

# The Coolest CDs In Town



What's the latest in CD's? You'd be surprised! The most popular CD in San Diego is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Administrative Record, now on CD.

The Southwest Division, Naval Facilities Engineering Command (SWESTDIV), is converting their paper CERCLA Administrative Records (ARs) files to a CD-ROM format for ease of use, retrieval and storage. The CDs will be distributed to the activities, the Remedial Project Managers (RPMs), and to the Information Repositories, if they have the equipment to view the CDs. The conversion is being accomplished via the existing Comprehensive Long-Term Environmental Action Navy (CLEAN) contractor.

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The contractor is using an imaging software package to create TIFF files for the CD. The pages are put into "batches" and a batch scanning process is used. The index for each AR is in Microsoft Access®, and is included on each CD. In a separate process, the files are also scanned as Optical Character Recognition (OCR) files. The OCR files are not corrected at this point. SWESTDIV is researching the possibility of using the Defense Accounting Printing Service to facilitate the OCR cleanup. The last step is to merge the OCR file with the TIFF and ACCESS files on the CD.

One CD can contain approximately 10, 000 pages, or about 5 cubic feet of records. Southwest is doing the preparatory work in-house, including removing bindings, staples, and blank pages, and adding title pages and slip sheets for intentionally blank pages. Also, adjustments are made for information that falls under the Privacy Act, or is proprietary, confidential, or classified. It takes about 10 hours to prepare the pages to go on one CD. It also takes about 10 hours to do a full Quality Assurance/Quality Control (QA/QC) on one CD afterwards, when the CD is set to play back at a browse speed of one second.

The ARs for the Naval Air Station (NAS) North Island, Marine Corps Air Station (MCAS) El Toro, and Marine Corps Mountain Warfare Training Center (MCMWTC) Bridgeport are the activities currently under conversion. NAS North Island has 37 cubic feet of records (68,000 pages) which takes seven CDs. MCWTC Bridgeport has 4 cubic feet (10,000 pages), a small AR, which fits on one CD. And MCAS EL Toro has about 50 cubic feet (90,000 pages) and requires 12 CDs. The SWESTDIV staff spent 148 work-hours in-house on the NAS North Island records during the conversion process. This includes indexing the records, QA/QC before and after scanning, and working with the contractor during the process.

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# Summary Regulatory Updates Now Available

## Quick, Easy, and Free

**RPM NEWS**
Remedial Project Manager News

Published By
NFESC

Using Appropriated Funds



Do you sometimes feel like you're the last to know about regulatory changes? Have you had a regulator "surprise" you with a new requirement? Who has time to read the Federal Register (FR) every week to keep up.

You can now get a weekly summary of items in the Federal Register that are of importance to Navy projects coming to you by email. The summary is in a format that allows you to quickly scan it for items of interest to you. You can be informed for your next discussion with your regulators.

The summary is a review of the contents of the Federal Register intended for use by Navy and Marine Corps environmental professionals. It is compiled by the Pollution Prevention Division (Code 42) of the Naval Facilities Engineering Service Center (NFESC). Its purpose is to provide fellow Navy environmental professionals with a quick overview of what is in the Federal Register that may have an impact on their projects.

The Summary contains general information about the service, a listing of the Federal Register items reviewed and summarized, and upcoming meetings listed in the Federal Register.

Each Federal Register item is summarized in an easy-to-read format containing the following information:

- Title of the item
- Date (appeared in Federal Register)
- NEPSS Work Area (such as General, NEPA, CAA, SDWA, Natural and Cultural Resources, CWA, Energy, Solid Waste, RCRA Hazardous Waste, Site Remediation, Risk Assessment, etc.)
- Action Type (Final Rule, Proposed Rule, Notice, Meeting Announcement, Documents Available, Policy Statement, Announcements, Call for Public Comments, etc.)
- Cite (Federal Register cite)
- Summary (a written summary of the contents of the Federal Register item)
- Potential Impact on Navy
- Further Information (point of contact as listed in FR)
- Full Text Documentation Location (web site address)

To be added to the subscription list (which is free) please email the "regdesk" at this internet email address: regdesk@nfesc.navy.mil. Include the following information in your email: your name, e-mail address, phone number, job title, command, and mailing address and, if possible, your Unit Identification Code (UIC).

Points of Contact:

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# Munitions Rule vs Range Rule

## You mean there are two different Rules? Why? What's the difference?

by Bernard K. Shafer (Office of the Assistant General Counsel)
and Barbara A. Johnson (Naval Facilities Engineering Service Center, NFESC))

The Munitions Rule was written by the Environmental Protection Agency (EPA). In the Federal Facilities Compliance Act, Congress directed EPA to define the point at which a munitions item becomes a hazardous waste under the Resource Conservation and Recovery Act of 1976 (RCRA), and how to manage it as a hazardous waste. The Munitions Rule went Final 12 February 1997.

The Range Rule was written by Department of Defense (DoD). This rule addresses the cleanup of closed, transferring or transferred ranges, including safety issues as well as effects on human health and the environment under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and DERP. The Range Rule was proposed 26 September 1997 and it is anticipated to go final sometime in mid-to late-1999.

So, which Rule rules? As for when munitions become wastes, EPA's Rule rules. As for how to clean up waste munitions at closed, transferring and transferred ranges, EPA has said, in its Munitions Rule, that if DoD promulgates a final Rule (the Range Rule) that effectively addresses the clean up of such ranges, DoD's Rule would rule.

### Munitions Rule – A Quick Summary

The Munitions Rule addresses three classes of munitions: unused munitions, munitions being used for their intended purpose, and used or fired munitions, and notes the conditions under which they become solid waste under RCRA (and, presumably, due to their reactivity or toxicity, hazardous wastes).

For the first category, unused munitions, they are considered to be a solid waste when they are "abandoned by being disposed of, burned, or incinerated, or treated prior to disposal"; when they are removed from storage for purposes of disposal, when they are deteriorated or damaged to the point they cannot be used; or when they are declared to be a solid waste by an authorized munitions manager.

For the second category, munitions being used for their intended purpose, they are NOT defined to be a solid waste. Thus, the use of munitions in combat, training, and even training for Explosive Ordnance Disposal (EOD) specialists, are all considered "using products for their intended purpose" and not the generation of solid waste (however, when the range upon which they are located becomes closed, transferring or transferred, there is a requirement that they be cleaned up per the DoD Range Rule).

For the third category, used or fired munitions, they are considered to be a solid waste when they are removed from their landing place and either managed off-range, or disposed of on-range.

### The Range Rule – A Quick Summary

The Range Rule covers the clean up of munitions and other hazardous constituents on ranges that are closed, transferring or already transferred. The Rule provides a process to evaluate response actions on these ranges that encompass safety, are protective of human health and the environment, and address risks based upon reasonably anticipated future land use.

A phased response process is outlined that begins with identifying all closed, transferred and transferring military ranges. The process provides for an Accelerated Response (AR) option, which would allow for implementing various protective measures early in the process. If the AR protective measures are not sufficient to address the risks posed at a range, a site-specific Range Assessment (RA) will determine what additional measures are necessary. This, in turn, will lead to a more thorough Range Evaluation (RE) process.

The RE process will include a detailed data collection effort to support a site-specific safety risk assessment, human health risk assessment and an ecological risk assessment. The last step in the process is an administrative close-out of the responses taken on the range. Throughout the Range Rule process there is, consistent with the requirements of CERCLA, an emphasis on involvement by Federal and State regulators, American Indian Tribes and the public. In fact, in the area of public involvement alone, the current proposed Range Rule creates far more opportunities for interaction than CERCLA calls for.

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# New Tool For Rapidly Evaluating Groundwater Transport Properties Now Available!

by Mark Kram NFESC, Code 413

A new tool has been added to the suite of direct-push applications offered by PWC San Diego and PWC Jacksonville. The device, called a "piezocone", has numerous applications in the environmental and construction fields. The piezocone uses pore pressure measurements to determine water table elevation and hydraulic conductivity. How do you suppose this information can help you with your project? The following is a partial list of the environmental piezocone applications:

- Determine the optimum depths at which to conduct groundwater sampling for contaminant plume delineation
- Determine the direction and gradient of subsurface water flow
- Check to see if aquifers are in direct hydrologic contact with each other
- Obtain accurate and highly resolved depiction of stratigraphic layers
- Determine the potential for risk by identifying groundwater flow pathways and candidate receptors
- Monitor remediation efforts by identifying induced gradients and cross-checking groundwater model predictions.

Figure 1 depicts a Hydraulic Conductivity Profile generated using piezocone data collected at selected depths within the same map location. This type of information can be used to look for preferential groundwater flow pathways, evaluate whether confining layers are present, and help design wells. Notice how much more resolved this data is than the typical information generated using an aquifer pumping or slug test.

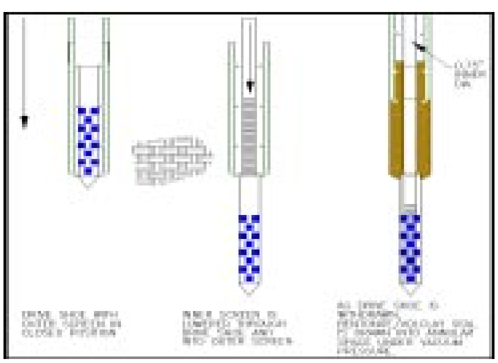


**FIGURE 1:** Example of a Hydraulic Conductivity Profile. Notice that the values are displayed on a logarithmic scale and that there are differences in hydraulic conductivity at each depth.

Figure 2 depicts a Hydrostatic Pressure Profile generated using piezocone data from selected depths at a single map location. This type of information can be used to determine water table elevation and identify multiple aquifer systems. In addition, determination of water table elevation at several locations will enable users to determine direction and gradient of groundwater flow.

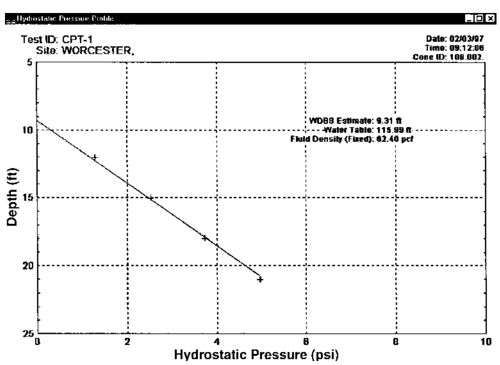



**FIGURE 2:** Example of a Hydrostatic Pressure Profile. The plotted line crosses the Y-axis at the water depth below the surface (WDBS) for that location. The water table elevation is calculated by subtracting WDBS from the surface elevation.

The following is a list of some of the benefits associated with using the piezocone:

- Near real-time computer processing of piezocone measurements will yield detailed stratigraphic profiles illustrating depths of water bearing formations and variations in permeability
- Significantly fewer groundwater monitoring and sampling wells will need to be installed
- Significantly fewer water samples will need to be collected (short-term and long-term)
- Hydraulic conductivity will be measured at any depth attainable by direct-push (not feasible with conventional wells)
- Identification of perched, confined, and unconfined zones will be possible (not generally feasible with conventional wells)
- More accurate risk assessments and fate and transport models will now be possible
- Groundwater dewatering projects can now be easily and accurately monitored

For more information about the piezocone, please contact:
Mr. Mark Kram Naval Facilities Engineering Service Center (NFESC)
Code 413
(805) 982-2669
DSN 551-2669

For more information on groundwater hydrology data for your site characterization efforts, remediation efforts, risk assessments, or dewatering projects for scheduling the piezocone into your process, please contact:

Mr. Rod Soule
PWC San Diego
(619) 556-9506
DSN 522-9506

Mr. George Steffen
PWC Jacksonville
(904) 772-4548, x8312

# The 1998 Department of the Navy Cleanup Conference

## Port Hueneme, CA

### WHY THEY CAME TO THE CONFERENCE

When conference goers were asked why they came to the conference, the answers fell into just a couple of categories:

People came to hear about:

Expected resources and funding levels

Washington DC perspective on the program

Success stories and share information

"Lessons Learned"

The latest on Ecological risk assessments

How to make use of institutional controls

Dr. Jim Wright, Head of the Environmental Department at Naval Facilites Engineering Command (NAVFAC) Headquarters (HQ), opened the conference with his perspective on the place of environmental programs within the restructuring Navy. He stated that we needed to find out the priorities of the operational Navy and coordinate our environmental planning accordingly. The Base Realignment and Closure (BRAC) program has been doing this successfully. The next several years will be a defining period for how the Navy will do business. Communication is important because roles may change. Environmental programs are major business lines and we need to take an advocacy role. Everything we do must support the new Navy and we must be consistent in our execution in the field.

Sid Allison, of Naval Facilities Engineering Command, Southern Division (SOUTHDIV) and a member of the restructuring team, gave us an update on the progress of their efforts. The first phase, which was completed in February 1998, was to write down all our processes. They have the environmental processes well defined and in place. The next step is to determine the shape and size and then integrate into the existing organization. Admiral Nash will visit each field component to present the newly restructured NAVFAC organization.

The Washington perspective on the cleanup program was given by Dave Olson of Chief of Naval Operations (CNO) N45, Ted Zagrobelny at NAVFAC, Paul Yaroschak of Assistant Secretary Navy (ASN), and Bernie Schafer of Office of Assistant General Counsel (OAGC). Dave Olson gave us an overview of the budget, based on NORM data and the criteria from the latest Defense Planning Guidance which requires all High ranked sites to be Response Complete (RC) or Remedy in Place (RIP) by FY07, and at least fifty percent of those by FY02.

Ted Zagrobelny emphasized the importance of correctly entering data into the NORM database, especially the phase start and end dates for Remedial Action Construction (RAC), Remedial Action Operation (RAO) and Long Term Monitoring (LTM), which determine the dates for Remedy In Place (RIP) and Response Complete (RC). We need to be reporting our data consistently, and not overlapping the phases. Part of the confusion is due to a lack of clear definitions for these terms and how to apply to various remedial technologies, such as natural attenuation. NAVFAC took this as an action item.

Paul Yaroschak of ASN gave an update on Senate Bill 8, the latest Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) legislation. The Department of Defense (DoD) and the Environmental Protection Agency (EPA) are keeping a close watch on it's progress. The negotiations for the Federal Facility Agreement (FFA) model language are almost over. Two key provisions in the new model are the allowances for extension of milestone deadlines under certain conditions and efforts to accommodate fiscal controls, although milestones are not to be driven by budget. On the issue of Lead Based Paint at industrial sites, the Department of the Navy (DoN) is developing a field guide for DoD, and hope to get concurrence on it from EPA, DoD, Housing and Urban Development (HUD) and General Services Administration (GSA).

Bernie Schafer of OAGC, explained under which statutes the DoN is required to pay state and/or Federal penalties. And, apparently, there have been quite a few liability issues come up on BRAC base property transfers. He presented a long list of these BRAC issues that was quite informative.

Al Hurt of Naval Facilities Engineering Command, Southwest Division (SWESTDIV), and Paul Lancer and D. Jeffery Smith of HQ United States Army Corps of Engineers (USACE), talked about the progress on Defense State Memorandum of Agreement (DSMOA) negotiations. The Army is the executive agent for negotiating DSMOAs for all of DoD. They are following the procedures in the new Cooperative Agreement guide, which came out in August 1997.

Another timely topic is exit strategies for closing out a cleaned up site. Doug Zillmer of the Naval Facilities Engineering Service Center (ESC), discussed ways to optimize the RAO phase and LTM/Management. Several guidance documents are out and a DoD/EPA guide is in the works.

After the opening session, breakout sessions were held in two different rooms. The Remedial Project Managers (RPMs) from the Engineering Field Divisions/Activities (EFD/As) gave presentations on their projects and topics of interest such as ecological risk assessments, innovative remedial technologies used on Navy sites, transferring properties, and others.

Considering the multitude of poster displays, video displays and handouts, no one went home empty-handed and hopefully everyone went home with their minds full of new ideas.

If you did not attend the conference, but would like to see the handouts, complete sets were assembled after the conference and mailed to the Code 18 at each EFD/A.

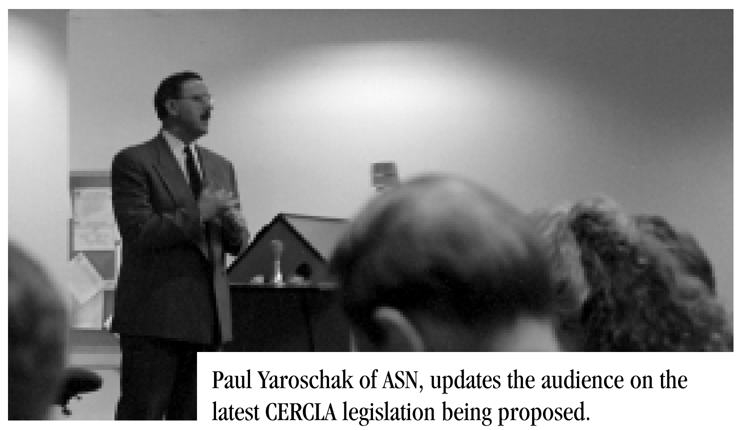

Dr. Jim Wright, head of the NAVFAC HQ Environmental Department, opens the conference.

Conference attendees at the opening session.

The Washington DC perspective- a panel including (from left to right) Dave Olson, of CNO, Ted Zagrobelny of NAVFAC HQ, and Bernard Schafer of OAGC (I&E).

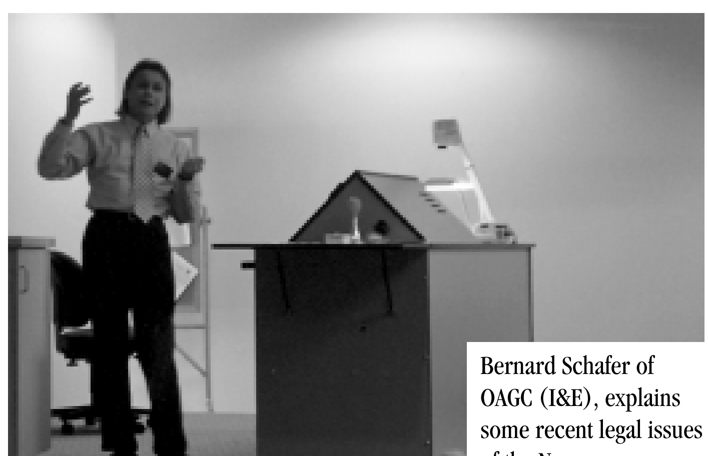
Ted Zagrobelny of NAVFAC HQ, talks about NORM data issues.

Dave Olson of CNO, gives an overview of how funding levels look for the next several years.



Paul Yaroschak of ASN, updates the audience on the latest CERCLA legislation being proposed.

Sid Allison of SOUTHDIV, talks about the progress of the restructuring effort.



Bernard Schafer of OAGC (I&E), explains some recent legal issues of the Navy.

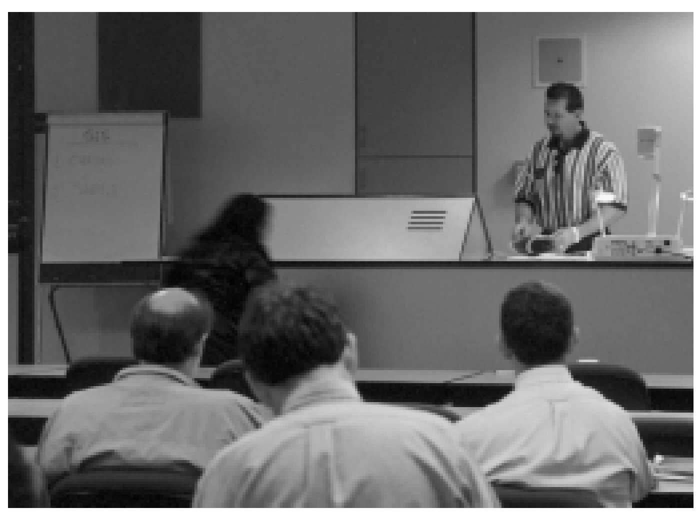
Doug Zillmer of the ESC, presents ways to optimize RAO and LTM as exit strategies.

Breakout Session C - Wanda Holmes of CECOS, leads a discussion during the RPM Forum.

Breakout Session D - Ryan Mayer of CECOS, explains the use of infrared aerial photography for groundwater investigations.

Breakout Session H - An RPM training session on Probabilistic Risk Assessment.

Breakout Session B - A panel discussion on Ecological Risk Assessments (from left to right) Dave Charters of EPA ERT, Sandra Cotter of NAVFAC, Steve Saepoff of EFA NW, and Karen Miller and Ruth Owens of ESC.



Breakout Session F - Richard Mach of SWESTDIV, talks about a VOC off-gas treatment technology.

# Installation Restoration Mole Pier Disposal Area

## Naval Station, San Diego, CA

by Rick Basinet (SWESTDIV), Jeff Heath, Robert Kratzke, Frank Rubesa, John Wollenberg (NFESC)

### Introduction

The Naval Facilities Engineering Service Center (NFESC) and Southwest Division of the Naval Facilities Engineering Command (SWESTDIV) worked cooperatively with regulatory agencies pertaining to efficient, cost-effective technology implementation and necessary oversight to attain target cleanup levels at a contaminated mole pier site. By using excavation and thermal treatment, mole pier restoration was accomplished promptly and proficiently at least cost. The remedial action was conducted in accordance with the Petroleum Exclusion under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the "Petroleum Exclusion" regulations under the State of California Health and Safety Code Section 25317 and requirements established by the State of California Water Quality Control Board, Region 9.

### Site Description

The mole pier disposal area is located at the southern end of Naval Station, San Diego, CA.


Figure 1. Disposal Pit Location

The Mole Pier occupies approximately 23 acres configured trilaterally. San Diego Bay and Paleta Creek border the Mole Pier to the west and northwest; and Mole Road and Cummings Road form the perimeter of southern and eastern boundaries.

The Mole Pier was constructed of hydraulic fill in 1942. From 1945 to 1972, hazardous wastes, construction debris, trash, and rubbish from the Naval Repair Facility, Public Works Center, and Station maintenance operations were deposited at the Mole Pier. However, the pier was never intended for use as a landfill.

Two specific areas of the pier required remedial action, the Wharf Builders Yard and the Disposal Pit. The Wharf Builders Yard is a rectangular area 200 feet long by 150 feet wide and 10 feet deep and the Disposal Pit is located within the yard. The Wharf Builders Yard was used for storage of preserved woodpiles. Due to leaching, wood preservatives probably impacted surface soil. As a result of extensive investigation, arsenic and copper were identified as potential metals of concern in the Wharf Builder's Yard surface soil and Total Petroleum Hydrocarbons as diesel (TPH-d) was delimited as the constituent of concern in the Disposal Pit subsurface soil. TPH-d concentrations were found as high as 29,800 mg/kg in the Disposal Pit area.

After a comprehensive investigation of applicable remediation technologies; low temperature thermal desorption (LTTD) was selected. Field activities lasting 11 months included site preparation; installation of four monitoring wells; excavation of metals and total petroleum impacted soil from the Wharf Builder's Yard and Disposal Pit areas; screening, shredding and on-site treatment of impacted soil using LTTD; sheet piling and high density polyethylene liner (HDPE) installation; backfilling; and compaction and installation of an asphalt concrete pavement over the Wharf Builder's Yard. Processed soil was utilized as subbase beneath the pavement.

### Field Work Description

LTTD employed for the mole pier remedial action is an ex-situ process using heat as the principal means of physically separating and transferring TPH-d from the soil. After being thermally desorbed, separated contaminants (vapors and particulates) were decomposed, although desorbers are not necessarily designed to facilitate contaminant decomposition.

TPH-d impacted soil was excavated and loaded into a hopper equipped with a tipping reject grid with bars to segregate material greater than 6 inches in diameter. A hydraulic feed conveyer equipped with a variable speed control adjusted the feed rate to match quantities and characteristics of materials being processed by the shredder. Shredded soil and material screening allowed a particle size of 2 inches or less to pass to the radial loading high capacity conveyor serving the thermal treatment unit. Oversized shredded material was reintroduced into the screening unit for further processing in order to reduce the volume of material requiring off-site disposal. The desorber transferred heat to TPH-d impacted soil. Soil was heated, water and hydrocarbons devolatalized, and off gas organics burned in the after burner.

Approximately 28,300 tons of hydrocarbon impacted soil was treated on-site and used as fill material in the Disposal Pit excavation. To guarantee that other contaminants found elsewhere on the Mole Pier do not migrate back into the treated fill material, a long sheet pile cut off wall 150 feet in length was installed along the Disposal Pit's northern sidewall. Additionally, 40-mil HDPE was installed along the pit's northeast sidewall and portions of the south and west sidewalls.

## LTTD Process Operation

Performance difficulties with several smaller LTTD units unable to satisfactorily thermally treat soil necessitated that a third, larger, thermal desorption unit be mobilized to the site. The LTTD unit that proved satisfactory processed 25 tons of soil per hour and was equipped with a stainless steel drum capable of attaining a temperature of 800-850°F in the primary chamber and up to 1,600°F in the afterburner. High temperatures were necessary to successfully treat soil.

Contaminated soil was fed by a front end loader into an 8 feet by 14 feet soil feed hopper with a tapered discharge opening into a 36 inch by 24.75 feet variable speed feeder belt conveyor. The feeder conveyor discharged through a vibrating screen that segregated any material greater than 2 inches in diameter into a 24-foot weight belt conveyor. The weight belt conveyor weighed the soil as it was fed through the thermal desorber. Segregated oversized material from the thermal desorber vibrating screen was rescreened and reshredded whenever possible.

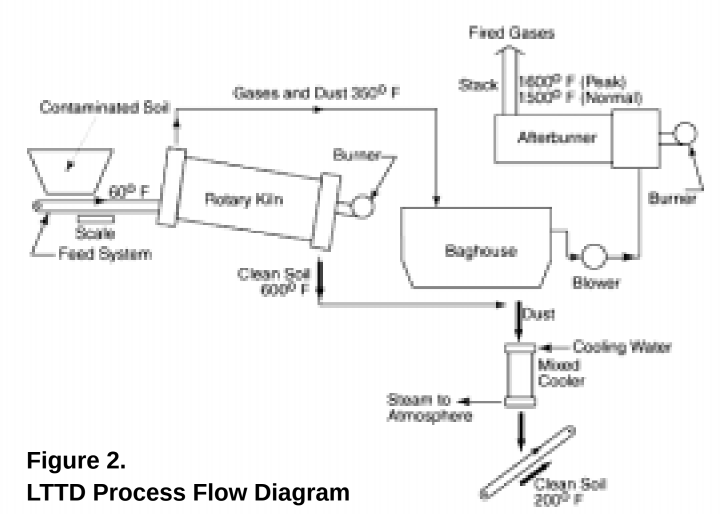



**Figure 2.**
**LTTD Process Flow Diagram**

The thermal desorber was a countercurrent stainless steel rotary drum 5 feet/4 inches in diameter and 20 feet long with internal flights and chain drive. A direct 17 million BTU/hour burner fired down the drum from the opposite end of the soil feed. The drum was equipped with inlet and outlet breaching and rotary drum seals. The desorber was trailer mounted along with the baghouse. Volatile compounds and moisture in the soil were evaporated by heat supplied by the direct firing burners. Hot treated soil from the thermal desorber discharged via a chute into a 24-foot auger system connecting an integrated knock-out-box and baghouse. The auger system discharged treated soil to a 24-foot belt conveyor which delivered the soil to a twin shaft mixer designed to cool soil via water injection. Evaporated volatles and water along with dust released by the desorption process were carried over by the rotary drum exhaust gases into the knockout box, where large particles dropped out of the gas stream. Baghouse gases were directed to a 7 inch diameter, 24-foot long thermal oxidizer, rated at 25 million BTU, where the hydrocarbon contents of the gas stream were treated to the County of San Diego Air Pollution Control District emissions standards.

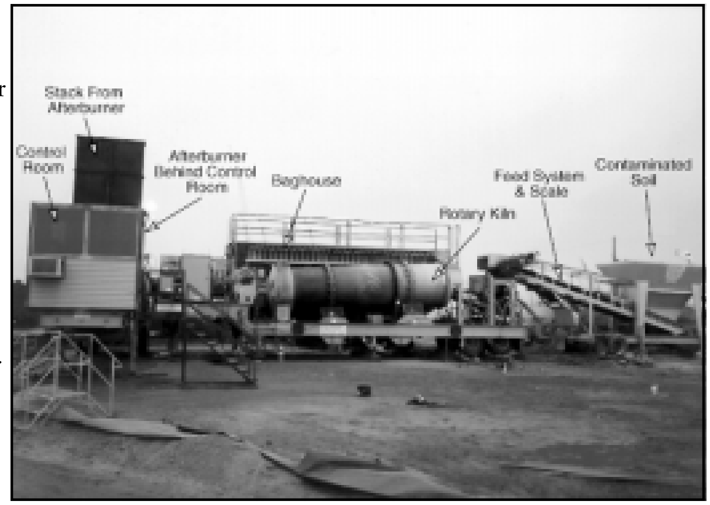



**Figure 3.** LTTD Unit

Approximately 28,300 tons of hydrocarbon impacted soil was treated. Treated soil volume was calculated from land surveys conducted throughout the duration of the entire project. The volume of oversize material that could not be treated on site was approximately 802.51 tons (only 2.79% of the excavated soil).

## Site Restoration

Approximately 4,000 tons of 3/4-inch crushed rock was used to backfill the Disposal Pit excavation. The 3/4 inch rock was placed, compacted, and used to raise the excavation floor to 8 feet bgs which is 2 feet above groundwater elevation. Approximately 12,000 cubic yards of thermally treated soil was placed in 6 inch lifts in the Disposal Pit excavation and compacted to 90% of dry density. Approximately 4,000 cubic yards of remaining treated soil was spread over a former baseball field adjacent to the Wharf Builders Yard (Refer to Figure 1). The average elevation of the former baseball field adjacent to the Wharf Builders Yard was raised from approximately 15 feet above mean sea level (MSL) to 17 feet above MSL. Treated soil was placed and compacted so any rainfall runoff drained toward the Wharf Builders Yard.

## Conclusion

The negotiated clean up goals mandated soil be treated to obtain TPH-d levels less than 1,000 ppm. However, most treated soil contained TPH-d levels of less than 100 ppm. Out of 1,400 treated soil samples, only four had TPH-d levels over 100 ppm.

A benefit of using LTTD at this site was the time saved completing the project. In-situ treatment was estimated to cost a few dollars less per cubic yard, but the site would have been encumbered twice as long.

**Figure 4.** Shredding material for Processing

# Site Remediation at Naval Station, San Diego (Site 8)

by Rick Basinet, Darren Belton (SOUTHWESTDIV), Jeff Heath, Robert Kratzke, Frank Rubesa, John Wollenberg (NFESC)

## Introduction

The Naval Facilities Engineering Command, Southwest Division (SWESTDIV) and the Naval Facilities Engineering Service Center (NFESC) worked cooperatively with regulatory agencies pertaining to efficient cost effective technology implementation and necessary oversight to attain target cleanup levels at a contaminated former fire fighter training facility. By using bioslurping (a method of teaming vacuum-enhanced free product recovery with bioventing) restoration is being accomplished promptly and proficiently at least cost. This remedial action is being conducted in accordance with the State of California Health and Safety Code Section 25317 and requirements established by the State of California Water Quality Control Board, Region 9.

## Site Description

The former Fire fighter Training Facility is located in the central portion of Naval Station (NS) to the northeast of Pier No. 8, adjacent to San Diego Bay. The facility was used for fire fighting training exercises from the late 1940's through 1996. Exercises were originally conducted using open petroleum hydrocarbon fires on two concrete pads (simulated flight decks). As environmental concerns regarding air emissions heightened, training was conducted within enclosed structures equipped with effluent air reburners and scrubbers. The site also contained a number of underground and above ground storage tanks, equipment storage areas, and office buildings.

The petroleum hydrocarbon material used in simulated fire fighting exercises included JP-4, JP-5, diesel fuel, unleaded gasoline, and oil. JP-5 was used most commonly. Approximately, 3,500 gallons of JP-4 and JP-5 were employed weekly to establish training fires.

Comprehensive environmental investigations identified two plumes of free-floating hydrocarbons in groundwater beneath the site (estimated 15,000 gallons). These plumes are probably ramifications of leaking Underground Storage Tanks (USTs) and fuel lines as well as the spraying of fuel and fire fighting foam in open areas that subsequently infiltrated into subsurface soil.

Following cessation of fire fighting exercises, primary pollution sources such as defective tank piping have been removed along with all storage tanks and other site structures. The site was rendered completely vacant and paved as part of the initiation of remedial activities. Actual and potential pollution sources have been eliminated with the exception of the two free-hydrocarbon plumes and leachate from soluble soil pollutants.

## Field Work Description

Bioslurping is being utilized to remove the free phase hydrocarbons floating on top the groundwater table. Bioslurping facilitates free-product recovery efficiently without requiring the extraction of large quantities of groundwater. The bioslurper system employed at the Fire Fighting Training Facility pulls a vacuum of 10 to 50 cm of mercury on recovery wells to create a pressure gradient that forces the movement of the hydrocarbon plume into wells. The vacuum enhanced recovery system increases product recovery rates over traditional skimming techniques by optimizing the effective hydraulic gradient and aquifer transmissivity. The effective hydraulic gradient is increased as a result of developing a cone of reduced pressure around each well; promoting a horizontal flow of fluids across the pressure reduced gradient. The increase in transmissivity results from an increase in saturated aquifer thickness. A single pump withdraws free-phase hydrocarbons, groundwater and soil gas in the same process stream. The liquid and soil gas mixture is processed through vapor/liquid and oil/water separators. Recovered hydrocarbons are temporarily stored in an aboveground storage tank prior to being recycled. Soil gas is currently being treated by a thermal oxidizer. As volatile organic compound (VOC) concentrations decline, a vapor phase carbon adsorption system replaces the thermal oxidizer. Extracted groundwater is treated through an oil/water separator, filtration and liquid phase carbon adsorption system prior to discharge. The system also has a negligible impact of drawdown in the aquifer, thus reducing the problem of free-product entrapment.

Bioslurping improves free product removal because the pressure gradient works primarily in the horizontal plain of soils, where air permeability and hydraulic conductivity are greatest. Fuel movement toward wells is promoted by both airflow in saturated soil zones and by establishing continuity of fluid flow in saturated soil zones. The applied vacuum also promotes fuel removal from the unsaturated zone by removing pockets of air that prevent the gravitational flow of liquid fuel.

When free-product removal activities are complete, the bioslurper system is easily converted to a conventional air injection bioventing system to complete remediation of vadose zone soils. Application of negative pressure to the vadose zone results in air movement, that promotes aerobic degradation of hydrocarbons. Site conditions are conducive to in-situ biodegradation of site contaminants.

**Figure 1. Extraction and Treatment System Installation**

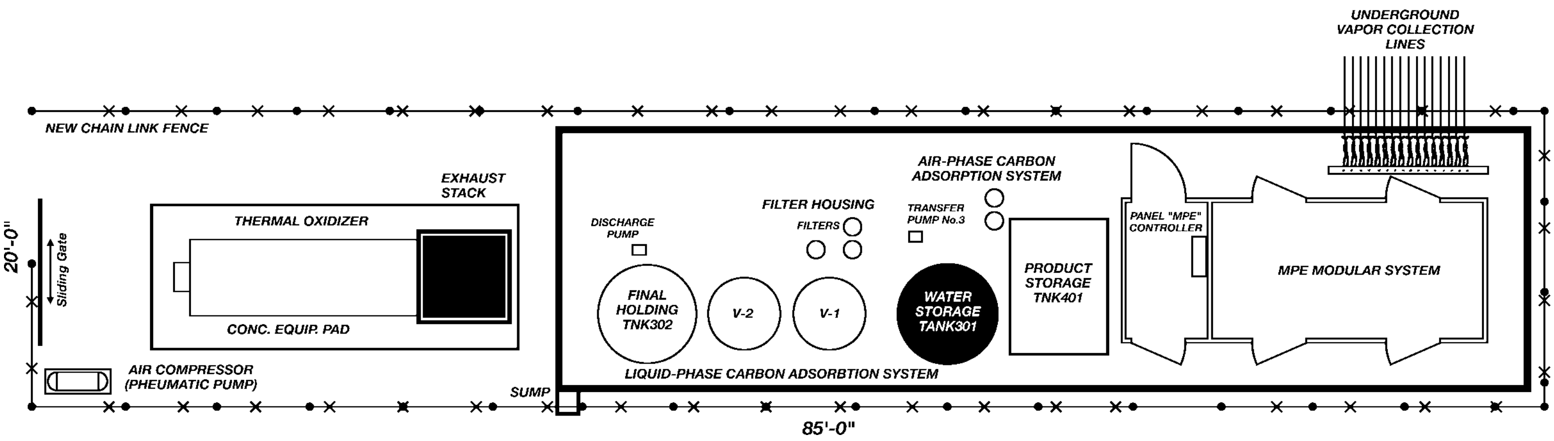



**Figure 2. Multi Phase Extraction and Treatment System**

## Bioslurping and Bioventing System Operation

The extraction system consists of 15 extraction wells in each plume (total of 30 wells) interfaced with a centrally located equipment compound. The wells are configured so that the radius of remediation is 40 feet. Site specific idiosyncrasies, including water table fluctuation, require esoteric extraction well design. Well screen slot size and surrounding gravel pack selection is based on soil grain size distribution to facilitate maximum fluid capture. Water table fluctuation mandates that screened intervals always extend above the free-hydrocarbon surface, but not into the vadose zone further than necessary. Therefore, wells extend to 20 feet bgs and screens are 15 feet long extending approximately 10 feet into and 5 feet above the groundwater table. The applied vacuum is as close to the free hydrocarbon surface as possible to maximize product recovery.

A rotary lobe compressor provides the airflow and vacuum necessary to move fluid. The high intrinsic permeability of vadose-zone soils and highly saturated hydraulic conductivites, require a fluid conveyance system able to accommodate higher airflows and produce lower vacuums. The rotary lobe compressor is interfaced with extraction wells via Schedule 80 polyvinyl chloride (PVC) piping running through extraction trenches. Extraction points can either extract fluids under vacuum or introduce air into the subsurface.

Fluid flows from the extraction wells into an air liquid separator to segregate vapor and liquid streams. Depending upon vapor concentrations the air stream either passes through the rotary lobe compressor directly into the atmosphere or to an off-gas treatment system for processing.

**Figure 3. Functioning Extraction and Treatment System**

## Summary

Two plumes of free-floating hydrocarbons are present over the groundwater table beneath the site. The Navy has initiated corrective action to remove the hydrocarbon plumes and remediate the hydrocarbon-impacted soil in contact with these plumes over an 18-month period.

Bioslurping, a vacuum-enhanced in-situ dewatering technology, is being implemented to attain target cleanup levels at a contaminated former fire fighter training facility. Bioslurping combines bioventing with vacuum-enhanced free-product recovery. Bioventing stimulates the in-situ aerobic bioremediation of hydrocarbon-contaminated soils.

Jet fuel (JP-4 and JP-5) gasoline and diesel are the primary hydrocarbon products detected in subsurface soil and groundwater in the form of light non-aqueous phase liquids (LNAPLs). The LNAPLs are floating on top of the groundwater within two distinct free-hydrocarbon plumes. Subsurface soil contacting the hydrocarbon plumes contain elevated hydrocarbon concentrations. Due to the low solubility of JP-5 dissolved-phase hydrocarbon concentrations in groundwater is almost nonexistent. Therefore, the two free hydrocarbon plumes at the site are the primary source of environmental concern. These plumes have remained stable for a significant period of time and do not present an immediate threat to adjacent marine environments. However, the hydrocarbon plumes constitute a potential pollution source for compromising groundwater quality. Therefore, this remedial action centers around the removal of the two free hydrocarbon plumes from the site.

Vacuum-enhanced free-product recovery extracts LNAPLs from the capillary fringe and water table. Upon removal of the two free-hydrocarbon plumes to the extent practicable leachate from soluble soil pollutants is remediated. Remaining contamination is addressed via natural attenuation. After the completion of groundwater and soil remediation natural attenuation will eliminate remaining pollutants.

# Bioremediation Facility

## Marine Corps Base Camp Pendleton (MCBCP)

by Mike Pinsoneault (MCBCP), Robert Kratzke, Bill Major, John Wollenberg (NFESC)

### Introduction

The Camp Pendleton bioremediation facility is unique because of its large size (approximately 7 acres). The facility consists of three interdependent but distinct parts: the pre-treatment soil storage area; two soil treatment pads; and a post-treatment storage area. The pre-treatment soil storage area contains four lined storage cells located in the northern portion of the facility varying in size from approximately 100 feet x 140 feet to approximately 100 feet x 185 feet. The soil treatment pads are located in the center of the site. The post-treatment soil storage area consists of two lined storage pads, each approximately 100 feet x 200 feet, located south of the treatment pads (Refer to Figure 1).

The facility is operated under Waste Discharge Requirements (WDRs) established by the California Region 9 Water Quality Control Board (RWQCB). Quarterly groundwater monitoring reports are submitted for review by the RWQCB. In the WDRs, the final disposition of the post-treatment soil is Camp Pendleton's Las Pulgas Landfill to be utilized as daily cover or industrial landfill.

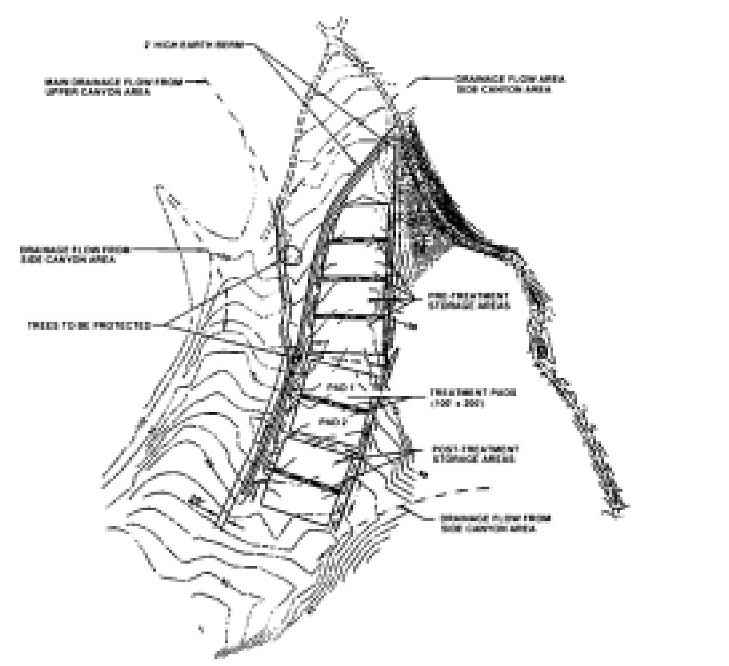


**Figure 1. Biotreatment Facility at MCB Camp Pendleton.**

### Treatment Pad Configuration

The soil treatment pads consist of two 200 feet by 100 feet, 8-inch thick concrete pads underlain with a 60-mil High-Density Polyethylene (HDPE) liner. Each pad has 12 troughs approximately 60 feet long, 1 foot wide and 8 inches deep which serve a dual function - creating a negative pressure through the soil pile and collection of system moisture. The troughs are spaced 15 feet apart. Each trough contains 2-inch slotted polyvinyl chloride (PVC) pipe covered by 3/4-inch gravel and a 1-inch thick metal grate. The 2-inch PVC enlarges to 4-inch PVC outside the pad and connects to a single 4-inch PVC header that runs to both the free-water knockout system and the water re-circulation system on the blower skid. The blower skid contains a 500 standard cubic feet per minute blower and motor, a free-water knockout tank, nutrient recirculation tank, blower discharge, water storage tanks, liquid transfer pumps and a control panel which monitors the system functions and has the capability to report malfunctions automatically via modem.

### Treatment Pad Operations

The soil piles are created seven feet high with approximately 4,500 cubic yards on each pad (refer to Figure 2). The liquid transfer pumps and the water storage tanks are utilized to apply water and nutrients during pile construction. While building the pile, the drip irrigation system is constructed to provide moisture. During the treatment cycle, the system operates at a 1-3 pounds per square inch vacuum. Water that leaches through the soil is collected at the header, is pumped to the storage tank and is subsequently reapplied to the pile through the drip irrigation system creating a closed loop liquid system. Similarly, water that is entrained in the air is collected by the free-water knockout tank and sent to the water storage tank for recirculation as shown in Figure 3.

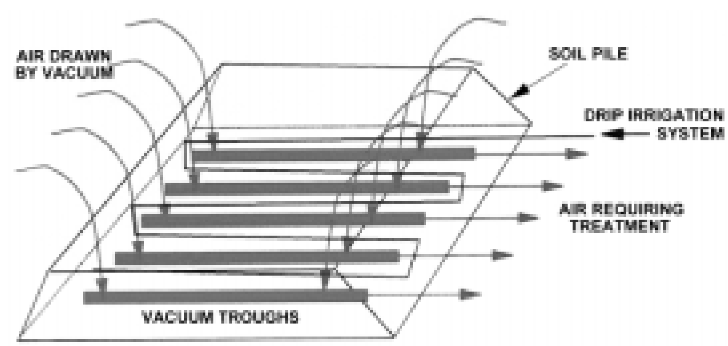



**Figure 2. Biopile schematic.**

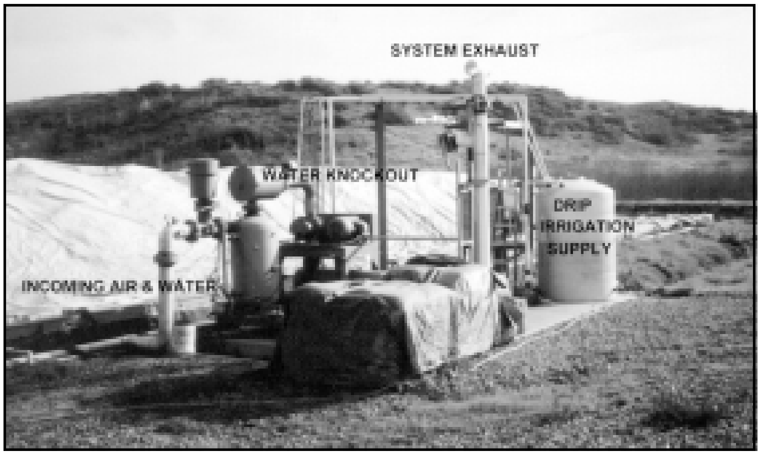



**Figure 3. Blower skid.**

## Treatment of Hydrocarbon Impacted Soil

Treatment was initiated for approximately 6,500 cubic yards of soils. Soils were placed on both treatment pads in the winter of 1995 and the spring of 1996. Soils accepted for processing came from the Underground Storage Tank (UST) remediation program, the Installation Restoration Program (IRP), one Military Construction (MILCON) project (avoiding at least 2 months in delays), two spills that occurred during training exercises, and other base facilities. Soils were characterized by the originator prior to acceptance, and accepted into the facility with a soil tracking form documenting characterization, receipt, handling and treatment, and discharge from the facility. A system is currently being created to track soils through the Geographical Information System (GIS) from extraction through disposal "a cradle to grave approach" insuring accurate tracking of soils being processed.

The soils treated on pad 1 came from 2 IRP sites. Pre-treatment Total Petroleum Hydrocarbons (TPH) levels for pad 1 soils ranged from 3,300 parts per million (ppm) to 7,600 ppm. Soils treated on pad 2 came from a total of 16 UST sites and 1 IRP site. Pre-treatment TPH levels for pad 2 soils ranged from 29 ppm to 27,000 ppm.

Soils were placed with minimum compaction in treatment piles on each pad with a front-end loader. During pile construction, soils were sprayed with nutrients consisting of ammonium nitrate and diammonium phosphate combined with a small amount of surfactant to assist nutrient penetration of soils. Immediately following soil pile construction, each pile was covered, and the blower system was activated, circulating air through the soil piles stimulating microbial action. Physical parameters were monitored during the treatment process to measure metabolization of fuel compounds. The treatment process was completed when residual fuel levels were reduced below regulatory thresholds.

## End-Treatment Sampling Results

At completion of treatment (14 weeks), sampling of soils was undertaken to confirm treatment effectiveness and substantiate a basis for the release of soils from the treatment program. Soil samples from each treatment pad were analyzed to test for the types of compounds identified as a result of pre-treatment testing including: TPH by DHS Method 8015 Modified for diesel; Volatile Aromatic Organics by Environmental Protection Agency (EPA ) Method 8020 for lighter molecular compounds; TPH by Deionized Toxicity Characteristic Leaching Procedure (TCLP) with EPA SW-846 Method 3510 preparation; Nitrogen as Ammonia, Nitrate and Nitrite, Phosphorus as Phosphate, pH and Soil Moisture. All analytical work was completed by a state certified laboratory.

End-treatment pad 1 soil TPH levels ranged from nondetect to 440 ppm. End-treatment pad 2 soil TPH levels ranged from nondetect to 480 ppm.

The end-treatment sampling program identified low to moderate levels of petroleum hydrocarbons in approximately 60 percent of the samples examined from each treatment pad, but measured values were all below 500 mg/kg TPH. No Benzene, Toulene, Ethylbenzene, Xylene (BTEX) compounds were detected in the six samples examined with the highest TPH concentrations. Analysis for TPH by Deionozed TCLP with EPA Method 3510 preparation was all below 4.6 mg/kg. Inorganic compound concentrations were generally low or not detected, with the exception of nitrate, which varied widely. Soil moisture and pH were moderately variable.

**Figure 4. Removal of treated soil.**

## The Initial Cycle

During the initial cycle, the two pads were constructed differently to determine if configuration would increase treatment effectiveness: Pad 1 was constructed with a simple drip system on top of the pile. Pad 2 utilized two drip irrigation systems - one on top and one in the middle of the pile. Additionally, two perforated 4-inch flex pipes connected to the blower were incorporated into the center of the pile in order to enhance pile aeration.

Despite the aforementioned treatment pile construction differences, final end-treatment sampling results from both treatment piles were very similar.

## Implications

As part of Marine Corps Base Camp Pendleton's overall environmental compliance program more than 100 UST sites are being assessed and cleaned up, most of which contain multiple USTs. Investigation, replacement and/or remedial activities for these USTs have identified soils that have been affected by diesel and jet fuel hydrocarbons as a result of previous operations and/or leaking tanks. Soil treatment costs usually vary from $19 to $24 per ton depending upon contamination levels and types as well as regulatory requirements.

# The Fastest Analysis in the West! or East! or Anywhere!

## Rapid, accurate, inexpensive data in the field? Sound too good to be true?

Wouldn't it be great if you could get contaminant analytical data quickly while in the field, no waiting for a lab results to make decisions on your sampling program or to make adjustments to your remediation processes. You could address regulator's concerns as they arise on site.

Would you believe there is a test kit that can be used by regular environmental field personnel that can provide results in 30 to 60 minutes?

Well, immunoassay test kits can do just that.

Immunoassay kits measure contamination directly within the soil, sludge, water, wipes or other matrices. The kits provide a high level of specificity to the compound of interest and can be correlated to lab methods. It saves money by reducing the amount of samples sent off-site for lab analysis. Field kits are less costly than lab analysis and the real-time information generated reduces cost and saves time by expediting field activities during site assessments and remediations.

### Variety of Test Kits Available

There is a wide range of analytes for which immunoassay kits are available. Environmental Protection Agency (EPA) validated kits are available for PCBs; PAHs; carcinogenic PAHs; TPH; PCP; TNT; RDX; DDT; Chlordane; Toxaphene; 2, 4 D; Atrazine and Cryptosporidium.

Other kits, not yet validated by an EPA analytical method, are available for BTEX, Crude Oil, polymers and about 50 pesticides. Kits are available to work in a variety of matrices such as soil, water, sludge, sediments, wipes, compost, wood, concrete, cable and others.

See insert #0001 for a complete listing of analytes, detection ranges and matrix information.

### Project Use

By incorporating the use of immunoassay kits into a sampling program or remediation design, project costs and time can be reduced. Immunoassay test kits have specific and limited uses, but, when used appropriately in conjunction with regular analytical tests, the number of samples sent to the lab can be greatly reduced. For sites where sampling and analysis is only required periodically or a quick turn-around on results is needed, these kits might be appropriate. Projects using the test kits have reported, in general, savings of anywhere from 20 to 60 percent. Kits cost anywhere from $18 to $35 per sample based on water, soil or other application.

There are some limitations. Immunoassay techniques are not a screening method to identify analytes, nor do they work as a multi-analyte method. The target analyte must be known. The chemical constituents of the matrix (soil, water, sludge, etc.) also need to be known before use.

The kits have been used on projects by the Department of Energy (DOE), EPA, FAA and the Department of Defense (DoD) components including the Air Force, Army Corps of Engineers and the Navy. Some of the Navy projects include NAS Adak, NAS Barbers Point, MCLB Barstow, NWS Crane, MCAS El Toro, NAS Guam, Midway Island, MCAS Miramar, NAS Moffett, NAS North Island, NAS Patuxent River, Philadelphia Navy Yard, Salton Sea Test Base, San Diego NS and Subase, NS Treasure Island, NAWC Trenton, MCAS Tustin and sites in Puerto Rico.

### Data Format and QA/QC

Kits are available in formats to provide qualitative data (absence or presence of analyte), semi-quantitative (> or < action levels), or quantitative (numerical index in ppb/ppm) data results. Higher concentrations of contaminants can be measured by using dilution procedures.

For some analytes, the kits are validated by EPA SW-846 methods, and some are certified by the State of California Environmental Protection Agency, and Department of Toxic Substances Control. Kits can be designed to meet your specific project needs. The kit provider offers application guidance to help meet your project's Data Quality Objectives (DQO). Information on specificity, selectivity, sensitivity, and test format compatibility can be provided beforehand to design your project's fieldwork. Guidance documents are available from EPA, US Army and California. (references and guidance documents are listed on Insert #0001).

### Brief History of the Technology

Immunoassay techniques were developed first in the medical field in the 1960's. They are routinely used in clinical situations for the analysis of proteins, hormones, and drugs. The technology was then transferred to the analysis of pesticides. The concept then spread through the environmental arena.

## Basic Science Underlying the Technology

Based in immunochemistry, the technology uses an antibody to bind with the target analyte and an enzyme conjugate that binds in absence of the target analyte. A "label" can then be bound to the antibody and the label then detected or measured, depending on the label. Typical labels include radioactivity, enzymes, fluorescence, phosphorescence, chemiluminescence, and bioluminescence.

In environmental analytical kits, enzyme labels are used and the specific technology is called Enzyme-Linked ImmunoSorbent Assay, or ELISA. A colorimetric substrate is used to detect the presence of, or measure the amount of, enzyme-analyte links. Color is developed from the presence of the enzyme conjugate and a colorimetric interpretation is made from the color of standards developed with the batch of samples. Results by method definition are to be interpreted as semi-quantitative, however quantitative determinations can be made as well. The procedure takes approximately thirty to sixty minutes, depending on the batch size and test format.

## How to Use the Kits on a Contaminated Site

Using the immunoassay test kits on a contaminated site requires advance knowledge of the site conditions to avoid potential matrix interference problems. For example, high levels of oil in soil interfere with PCB analysis. The DDT test kit also detects metabolites with similar structures like DDE and DDD. Kits can also be customized for a specific site through use of site sample calibrators in conjunction with laboratory sample analysis to determine custom correlation to contaminants.

Kits are typically easy-to-use. Anyone can perform the field analysis. When sampling soils, a 10-gram sample is taken from the field, weighed and dispensed into a pre-filled bottle of methanol. The bottle is shaken for 1 minute and left to stand for 1 minute. A small volume of liquid sample is then taken from the bottle and placed into a filtering device. This disposable device quickly filters any particulate from the sample.

The sample is now ready to run in either a flow-through format or a test tube format. This extraction method also has similar applications for surface wipes, sediments and water samples. When operating the test kits, based on which format applies, either dropper bottles or pipettes are used to transfer samples and calibrators onto flow-through devices or into test tubes.

Once color appears and development of color has stopped, the tube or device is measured by an instrument that interprets the intensity of the color and displays a reading. The results are compared to standard or customized calibrators in either a qualitative, semi-quantitative or quantitative interpretation.

## Kit Shelf-Life

Some kits require refrigeration to meet expected shelf life of three to nine months. Kits that don't need refrigeration are also shelf stable for approximately three to nine months. When taking kits out to the field, a simple cooler with an ice-brick or equivalent should be provided to store kits when not in use.

## Source for Kits

Numerous small companies initially were involved in the development of immunoassay kits for use in the environmental field. In 1996, these small companies (EnSys, Ohmicron, Envirogard, D-Tech, Environmental Diagnostics, and Strategic Diagnostics) merged to form one company called Strategic Diagnostics. They now provide all the products of the above listed companies. The company provides advice and guidance for selection and use of their products based on the customer's site-specific requirements.

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Phone: 1-800-544-8881 ext. 676
or (302) 456-6789
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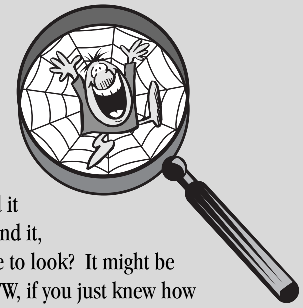
## Where's *WWW*aldo?



Need environmental information on a specific issue or topic and need it quick, but can't find it, don't know where to look? It might be hiding on the WWW, if you just knew how to access it.

Sometimes searching for useful information on the Internet is like looking for a needle in a haystack. Searching for information on the Internet can be very time-consuming if you're not sure where to look or what to look for. However, the information you eventually find is priceless because it's fast, efficient and very informative.

We would like to take some of the guesswork out of finding information and provide a way to locate environmental information such as regulatory updates and technology news quickly, and cheaply. This will allow you and others to access environmental information by knowing what's available on the web and more importantly, where to find it. We are providing you with the start of an Environmental Information Internet Directory, Insert #0002, to help you locate this information quickly and efficiently.

This directory was complied by the Naval Facilities Engineering Service Center (NFESC). The directory is alphabetical by web site name and contains the web page provider and web address with a brief description of what information is provided on the web site. Some of the web sites may have a cost associated with it, so please check for fees before using.

With your help, we can make this directory even more useful and fulfilling by adding to this directory as you come across useful environmental web sites. If you have a favorite web site or discover a new one that is not listed in the directory, or have any suggestions for the format in which the directory is presented, please email the information to Anita Ortiz at aortiz@nfesc.navy.mil.

If you use any of these web pages and have comments on the Rating it was given, please let us know.

This directory should be a useful tool to help you access information you need quickly and easily, find new technologies to clean up your sites faster and cheaper, and stay ahead of the regulators.

# New DoD Instruction Out UXO Safety on Ranges For Active and Inactive Ranges

DoD Instruction 6055.14

For a considerable period of time, Department of Defense (DoD) Instruction 6055.14, Unexploded Ordnances (UXO) Safety on Ranges (23 Jan 98), has been in the works. It is an important instruction for reasons separate from the issue of safety. The impact this instruction has on environmental programs such as Installation Restoration (IR) cleanups can be seen specifically in one section. In Section 6.11, the following standards have been established for "releases" or "substantial threats of release":

"6.11 Respond, in accordance with DoD's response authorities under 10 U.S.C. 172 and 2701 (reference (a)), and 42 U.S.C. 9604 (reference (f)), to releases or substantial threats of release of hazardous UXO constituents, from an active or inactive range to an area off such range when such release or threat of release poses an imminent and substantial threat to human health or the environment."

In other words, should there be any issue as to whether there is a "release" in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-sense of the word, the DoD policy is to respond utilizing our authorities under DoD Explosive Safety Board's (DDESB) statute (172), Defense Environmental Restoration Program (DERP) (2701), and CERCLA (9604). This is the same combination of authorities we have proposed for the Range Rule at closed, transferring, and transferred ranges. Such an assertion will of course not satisfy those regulators who insist that ALL releases must be under their exclusive authority under Resource Conservation and Recovery Act (RCRA) or their state-CERCLA-like laws. Nonetheless, the DoD Instruction does give us a reasoned direction should this issue arise at your active and inactive ranges, small and large.

A copy of the DoD Instruction 6055.14, UXO Safety on Ranges, is included in this newsletter as Insert #0003. If you have any questions about the Instruction or its' application to your project, contact Bernie Schafer.

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